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4. The method as defined in claim 3, wherein said cyclone has an cut-off aerodynamic diameter (d_{pa50}) ranging from 10 to 200nm.

5. The method as defined in claim 3, wherein said cyclone has a theoretical cut-off aerodynamic diameter in the range of 1-100nm, which is computed by an equation as follow:

$$d_{pa50} = 0.106 \left(\frac{P_{cyc}}{P_{760}} \right)^2 \frac{\mu (r_{\max}^2 - r_{\min}^2)^2 (P - N w)}{\rho_{po} n \zeta Q_0 r_{\min}^2 N^2 \lambda_o}$$

in which P_{cyc} stands for pressure, expressed in unit of torr, in the interior of the cyclone; P_{760} , 760 torr; Q_0 , flow rate of the nanoparticle flow under normal pressure and temperature; λ_o , mean free path of air molecule under normal pressure and temperature; μ , viscosity of gas of the nanoparticle flow; r_{\max} , maximum radius of the guide wing piece; r_{\min} , minimum radius of the guide wing piece; P , interval of guide wing pieces; N , number of the guide wing pieces; w , thickness of the guide wing piece; ρ_{po} , nanoparticle density; n , loop number of the guide wing piece; ζ a fitting constant enabling the theoretical efficiency to conform with the experimental data disclosed in the research literatures.

6. A method of making an axial flow helical cyclone for use in collecting nanoparticles, said axial flow helical cyclone comprising a chamber and a whirling mechanism, said chamber being provided with an entrance for admitting a flow entraining the nanoparticles into the cyclone, and an exit for discharging the flow from the cyclone, said whirling

1 mechanism being located in said chamber such that said whirling
2 mechanism is located between said entrance and said exit, said whirling
3 mechanism comprising a cylindrical body and a continuous spiral guide
4 wing piece or a plurality of segmented spiral guide wing pieces disposed
5 on an outer surface of said cylindrical body and circumventing an axis of
6 said cylindrical body, wherein a passage is defined by said spiral guide
7 wing piece or pieces, the outer surface of said cylindrical body and an
8 inner wall of said chamber contiguous to said spiral guide wing piece or
9 pieces, said passage being used for the nanoparticle flow to pass through
10 while the nanoparticle flow is caused to whirl, so that nanoparticles
11 entrained in the nanoparticle flow are acted on by a centrifugal force to
12 collide with the inner wall of said chamber, wherein said method
13 comprises making said cyclone so that said cyclone have a theoretical
14 cut-off aerodynamic diameter in the range of 1-100nm, which is computed
15 by an equation as follows:

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$$d_{pa50} = 0.106 \left(\frac{P_{cyc}}{P_{760}} \right)^2 \frac{\mu (r_{\max}^2 - r_{\min}^2)^2 (P - N w)}{\rho_{po} n \zeta Q_0 r_{\min}^2 N^2 \lambda_o},$$

18 in which P_{cyc} stands for pressure in the interior of the cyclone
19 and is smaller than 20 torr; P_{760} , 760 torr; Q_o , flow of the nanoparticle flow
20 under normal pressure and temperature; λ_o , mean free path of air
21 molecule under normal pressure and temperature; μ , viscosity of gas of
22 the nanoparticle flow; r_{\max} , maximum radius of guide wing piece; r_{\min} ,
23 minimum radius of the guide wing piece; P , pitch of the guide wing pieces;
24 N , number of the guide wing piece; w , thickness of the guide wing piece;
25 ρ_{po} , nanoparticle density; n , loop number of the guide wing piece; ζ , a

- 1 fitting constant enabling the theoretical efficiency to conform with the
- 2 experimental data disclosed in the research literatures.